1914

Tests of rock drill bits for Water-Leyner machine

Riley Marsh Simrall

Edmond Otis Stoliker

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TESTS OF ROCK DRILL BITS FOR WATER-LEYNER MACHINE.

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R. M. Simrall

E. O. Stoliker

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THESIS

submitted to the faculty of the

SCHOOL OF MINES AND METALLURGY OF THE UNIVERSITY OF MISSOURI

in partial fulfillment of the work required for the

DEGREE OF

BACHELOR OF SCIENCE IN MINE ENGINEERING.

Rolla, Mo.

1914

Approved by: C R Forbes

Professor of Mining.

TESTS OF ROCK DRILL BITS FOR WATER-LEYNER MACHINE.

Introduction:

The above investigation was made in the Mining Laboratory of the Missouri School of Mines, under the direction of Prof. C. R. Forbes, with the following object in view:

To make comparative tests of various types of regular and special bits for the Water-Leyner machine as to drilling speed and total distance drilled by each bit without resharpening.

The No.7 Water-Leyner machine was mounted on a vertical bar in a timber drilling frame, and the drilling was done in a hard granite block from Southeast Missouri.

Special endeavor was made to keep certain factors which would greatly influence the results constant. With this idea in view a pop-off valve in the air transmission line was set to keep the air pressure constant at 80 pounds gage. All drill steel used in the investigation was sharpened on a No.5 Leyner sharpener and tempered in oil by an experienced man.

With these two variable eliminated as far as possible the only remaining possibilities for great

error lay in the operation of the machine and the taking and recording of data.

Considerable difficulty was experienced on numerous occasions however, in the operation of the machine due to water leaking into the valve chest, to wearing and lost motion of the rotating device, and to certain inequalities in drilling speed due to the position of the machine in the guides.

Each bit was used until it lost its gauge and ceased rotating properly.

The data taken in the investigation follows in tabulated form:

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 2 inches
Length of Steel Starter
Kind of Steel EVAB 1⅛" Hollow round
Air Pressure 80 pounds

Names
R M Simrall
E O Staliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
		4P-1			2"		
26.12							
24.50	1.62						
21.50	3.00	4.62	2	1.5		1 31/32	
26.00	New hole						New hole
23.00	3.00	7.62	1	3.0			
18.37	4.63	12.25	3	1.54			
17.50	.87	13.12	1	.87			
16.87	.63	13.75	1	.63			
		4P-7					
23.75							
20.95	2.80	2.80	1	2.80	2"		
18.60	2.35	5.15	1	2.35			
16.50	2.10	7.25	1	2.10		1 29/32	
25.75		New hole					
24.62	1.13	8.38	1	1.13			Temper too soft
		4P-9					
21.50					1 31/32		
20.15	1.35	1.36	1	1.35	F°	1 50/32	
18.28	1.87	3.22	1	1.87			

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 7 Water Leyner
Kind of Bit Regular Cross Bit
Gauge 2 inches
Length of Steel Starter
Kind of Steel F.J.H.B. 1½" Hollow Rum.
Air Pressure 80#

Names
R.M. Simrall
E.O. Staliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
4P-9	cont New hole						
21.50	to 2						
22.50	1.12	4.34	1	1.12			
21.37	1.13	5.46	1	1.13			
20.00	1.37	6.83	1	1.37		1 27/32	
	4P-13						
22.50					2"		
19.87	2.62	2.62	1	2.62			
17.75	2.12	4.74	1	2.12			
15.87	1.87	6.61	1	1.87			
14.50	1.37	7.98	1	1.37		1 29/32	
	4P-18						
24.25					1 31/32		
22.62	1.62	1.63	1	1.63			
21.12	1.50	3.13	1	1.50			
19.37	1.75	4.38	1	1.25		1 29/32	Temper too soft

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 2"
Length of Steel Long starter
Kind of Steel FIAB 1⅛" hollow round
Air Pressure 80 #'s

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
	4 P-10						
23.50					1 31/32		
20.87	2.63	2.63	1	2.63			
18.37	2.50	5.13	1	2.50			
15.87	2.50	7.63	1	2.50			
13.37	2.50	9.13	1	2.50		1 28/32	
23.37	New hole				1 28/32		
21.50	1.87	11.00	1	1.87			
19.87	1.63	12.63	1	1.63			
18.87	1.00	13.63	1	1.00			
18.00	.87	14.50	1	.87		1 27/32	
	4 P-10 A						
24.30							
20.75	3.55			3.55	2"		
18.87	1.88	5.43	1	1.88			
16.87	2.00	7.43	1	2.00			
14.87	2.00	9.43	1	2.00			
12.50	2.27	11.70	1	2.27			
9.88	2.62	14.42	1	2.62			
7.35	2.53	16.95	1	2.53		1 28/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 2"
Length of Steel Long starter
Kind of Steel EJAB 1⅛" hollow round
Air Pressure 80 lbs

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
	4P-10A can't - new hole						
22.70							
21.62	1.08	18.03	1	1.08			
20.25	1.37	19.40	1	1.37			
19.00	1.25	20.65	1	1.25			
18.25	.75	21.40	1	.75		1 27/32	
17.75							

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Flat cross-bit
Gauge 2"
Length of Steel Long starter
Kind of Steel FJAB 1½" hollow round
Air Pressure 80 #

Names
R M Simrall
E O Stoliker
Date

CHUCK TO ROCK.	~~TOTAL~~ DISTANCE DRILLED	total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
	4P-F-21			See column 2-	2"		
23.12			1				
19.87	3.25	3.25	1				
17.15	2.72	5.97	1				
14.87	2.28	8.25	1				
12.70	2.17	10.42	1				
10.40	2.30	12.72	1				
8.15	2.25	14.97	1			1 29/32	
23.25	New hole				1 29/32		
21.06	2.19	17.16					
18.75	2.31	19.47					
15.80	2.95	22.42					
13.87	1.93	24.35					
11.00	2.87	27.22				1 27/32	
23.18	New hole				1 27/32		
21.93	1.25	28.47	1				Held up good
21.25	.68	29.15	1			1 27/32	end

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6-point
Gauge 2"
Length of Steel Starter-regular
Kind of Steel FTAB 1⅛" hollow round
Air Pressure 80#

Names E. O. Stalker, R. M. Sinrall
Date

CHUCK TO ROCK.	DISTANCE DRILLED	total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
		6P-1		Same as Column 2			
19.12					1 30/32		
16.12	3.00	3.00	1				
13.62	2.50	5.50	1				
11.37	2.25	7.75	1				
9.50	1.87	9.62	1			1 27/32	
18.40	— New hole				1 27/32		
17.00	1.40	11.02	1				75# s
14.68	2.32	13.34	1				
12.62	2.06	15.40	1				
11.28	1.34	16.74	1				Bit flattened and chipped
9.80	1.48	18.22	1			1 26/32	
		6P-9					
28.12					2"		
25.62	2.50	2.50	1				
23.37	2.25	4.75	1				
21.25	2.12	6.87	1				
19.50	1.75	8.62	1				
17.50	2.00	10.62	1				
17.37			+				
15.50	1.87	12.49	1				
~~13.37~~	~~2.13~~	~~14.62~~	1				
11.75	1.62	16.27	1			1 27/32	

Much difficulty experienced with machine.

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 2" T
Length of Steel Regular Starter
Kind of Steel FJAB 1⅛" Hollow round
Air Pressure 80 #

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
14.25		6P-4			2"		
10.62	3.63	3.63	1	3.63			
7.62	3.00	6.63	1	3.00			
5.15	2.47	9.10	1	2.47		1 28/32	
		New hole					
14.50					1 28/32		
13.87	.63	9.73	1	.63			
13.25	.64	10.37	1	.64			
12.50	.75	11.12	1	.75		1 27/32	One point broke off
		GP-5					
11.75					1 31/32		
9.87	1.88	1.88	1	1.88			
7.45	2.42	4.30	1	2.42		1 29/32	
12.25		New hole					
9.50	2.75	7.05	1	2.75		1 28/32	
11.75		New hole					
10.50	1.25	8.30	1	1.25			
12.37		New hole					
10.75	1.62	9.92	1	1.62			

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 2"
Length of Steel long + starter
Kind of Steel FJAB 1⅛" hollow round
Air Pressure 80#

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DRILLED	DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
							Long starter
17.62	6P-8						
16.50	1.12	1.12	1	1.12	2"		
27.50							
26.56	.94	2.06	1	.94			
25.25	1.31	3.37	1	1.31			
24.60	.65	4.02	1	.65		1 27/32	
	6P-13						
27.25							Long starter
25.40	1.85	1.85		1.85	2"		
23.87	1.53	3.38		1.53			
22.37	1.50	4.88		1.50			
21.06	1.31	6.19		1.31			
19.87	1.19	7.38		1.19			
18.75	1.12	8.50		1.12			
17.75	1.00	9.50		1.00			
16.80	.95	10.45		.95			
15.93	.77	11.22		.77			
15.06	.87	12.09		.87			
15.00	~~1.00~~	~~13.09~~					
14.00	1.00	13.09	1	1.00			
~~13.00~~	1.00	14.09	1	1.00		1 29/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 7 Water-Leyner
Kind of Bit Regular 4 point
Gauge 1 3/4
Length of Steel Second
Kind of Steel FJAB 1/8' Hollow St
Air Pressure 80#

Names
R.M. Simrall
E.O. Staliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
31.50		4P – 2			1 23/32		
26.50	5.00						
18.00	8.50	13.50	3'	2.83			
13.37	4.63	18.13	2'	2.31			
30.50		New hole					
26.12	4.38	22.51	1'	4.38			
22.12	4.00	26.50	1'	4.00			
18.50	3.60	30.12	1'	3.60			
15.25	3.25	33.37	1'	3.25			
12.50	2.75	36.12	1'	2.75			
23.35		New hole					
20.25	3.10	39.22	1'	3.10			
17.35	2.90	42.12	1'	2.90			
15.75	1.60	43.71	1'	1.60		1 20/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 7 Water-Leyner
Kind of Bit Regular 4 point
Gauge 1 3/4
Length of Steel Regular Second
Kind of Steel E.J.A.B. 7/8 Hollow round.
Air Pressure 80 #

Names
R.M. Simrall
E.O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
30.65		4 P-M			1 22/32		
29.15							
28.25	2.40	2.40	1'				
26.25	2.00	4.40	1'	2.00			
23.87	2.38	6.78	1'	2.38			
21.12	2.75	9.53	1'	2.75			
18.62	2.50	12.03	1'	2.50			
16.22	2.40	14.43	1'	2.40		1 19/32	
14.05	2.17	16.62	1 1/4	1.74			
31.62		New	hole				
29.00	2.62	19.22	1'	2.62			
26.00	3.00	22.22	1'	3.00			
26.37							
23.50	2.85	25.07	1'	2.85			
20.62	2.88	27.95	1'	2.88			
18.12	2.50	30.45	1'	2.50			
16.05	2.07	32.52	1'	2.07		1 35/32	
21.75		New	hole				
17.87	3.88	36.40	1'	3.88			
14.50	3.38	39.77	1	3.38			Steel lost gage

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 1 3/4"
Length of Steel Regular 2nd
Kind of Steel FJAB 1⅛" Hollow round
Air Pressure 80 #s

Names
R M Simrall
E O Stalker
Date

CHUCK TO ROCK.	~~Total~~ DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
	4P-5						
26.50							
22.75	3.75	3.75	1		1 24/32		
19.62	3.13	6.88	1				
29.00	—	New hole					
27.12	1.88	8.76	1				
25.12	2.00	10.76	1				
33.50	—	New hole					
31.87	1.63	12.39	1				
28.50	3.37	15.86	1				
25.50	3.00	18.76	1				
21.75	3.75	22.51	1				
18.00	3.75	26.26	1				
31.30	—	New hole					
28.75	2.55	28.81	1				
27.50	1.25	30.06	1				
23.87	3.63	33.69	2	1.81		1 18/32	

None on column 2

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 1 3/4"
Length of Steel Regular 2nd.
Kind of Steel F.J.A.B. 1 1/8" Hollow round
Air Pressure 80 lbs

Names
E. O. Stoliker
P. M. Sinnall
Date

CHUCK TO ROCK.	~~TOTAL~~ DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
26.50	4 P-14			Same as Column 2	1 23/32		
23.00	3.50	3.50	1				
19.75	3.25	6.75	1				
16.50	3.25	10.00	1				
13.25	3.25	13.25	1			1 21/32	
23.12	New hole						
19.25	3.87	17.12	1				
15.75	3.50	20.62	1				
13.37	2.37	22.99	1			1 19/32	
31.37	New hole						
27.25	4.12	27.11	1				
23.50	3.75	30.86	1				
21.00	2.50	33.36	1				
18.62	2.37	35.73	1				
15.75	2.87	38.60	1				
14.00	1.75	40.35	1			1 15/32	
30.87	4 P-19				1 3/4"		
26.95	3.92	3.92	1				
24.30	2.65	6.57	1				
22.00	2.30	8.87	1			1 19/32	Too soft

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Flat x-bit - high center
Gauge 1 3/4"
Length of Steel Regular 2nd
Kind of Steel FJAB hollow round 1 1/8"
Air Pressure 80 #s

Names E. O. Stoliker, R. M. Simrall
Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
29.05	4 P-F-16			See column 2	1 3/4		Poor rotation. 100 # off also.
26.75	2.30	2.30	1				
24.87	1.88	4.18	1				
23.15	1.72	5.90	1				
21.12	2.03	7.93	1				
20.22	.90	8.83	1				
19.60	.62	9.45	1			1 19/32	
15.75	4 P-F-20				1 3/4		
11.25	4.50	4.50	1				
11.87	New hole						
7.87	4.00	8.50	1				
17.06	New hole					1 20/32	
13.87	3.19	11.69	1				
12.30	1.57	13.26	1				
10.75	1.55	14.81	1			1 19/32	
28.50	New hole						
27.18	1.32	16.13	1				
26.37	.81	16.94	1			1 18/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 1 3/4"
Length of Steel Regular 2nd.
Kind of Steel FJAB 1/2" hollow round
Air Pressure 80 #s

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
23.62		6 P-2			1 3/4		
20.12	3.50	3.50	1				
17.12	3.00	6.50	1				75 #s air
13.62	3.50	10.00	1				
11.00	2.62	12.62	1				
7.75	3.25	15.87	1				1 20/32
24.10	New hole						
20.05	4.05	19.92	1				
16.37	3.68	23.70	1				
13.16	3.21	26.91	1				
10.10	3.06	29.97	1				
8.00	2.10	32.07	1				1 18/32
22.37	New hole						
19.37	3.00	35.07	1				
15.87	3.50	38.57	1				
12.50	3.37	41.94	1				
9.00	3.50	44.44	1				
5.75	3.25	47.69	1				1 18/32
28.37	New hole						
26.82	1.55	49.24	1				
26.12	.70	49.94	1				1 18/32

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 1¾
Length of Steel Regular 2nd
Kind of Steel FJAB 1¼" hollow round
Air Pressure 80 #

Names
R.M. Simrall
E.O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
28.00	— 6P-6				1 3/4		
24.25	3.75	3.75	1				
21.00	3.25	7.00	1				
18.00	3.00	10.00	1				
14.95	3.05	13.05	1				
12.12	2.83	15.88	1			1 20/32	
30.00	— New hole						
26.75	3.25	19.13	1				
23.75	3.00	22.13	1				
20.75	3.00	25.13	1				
17.12	3.63	28.76	1				
13.25	3.87	32.63	1			1 39/64	
31.00	- New hole						
27.87	3.13	35.76	1				
25.75	2.12	37.88	1			1 19/32	
22.37	- New hole						
17.50	4.87	42.75	1				
13.62	3.88	46.63	1				
10.00	3.62	50.25	1			1 17/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 1 3/4
Length of Steel 2nd
Kind of Steel EJAB - hollow round 1 1/8"
Air Pressure 80 #

Names R.M. Simcall, E.O. Stoliker
Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
		6P-10			1 3/4		
26.55				See Column 2			
23.37	3.18	3.18	1				
20.62	3.75	6.93	1				
17.80	2.82	9.75	1				
15.55	2.25	12.00	1				
13.62	1.93	13.93	1				
10.92	2.70	16.63	1				1 20/32
	Machine to be overhauled						

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 8 point
Gauge 1 3/4"
Length of Steel Regular 2nd
Kind of Steel F.J.A.B. 1⅛" hollow round
Air Pressure 80 lbs

Names
R.M. Simrall
E.O. Stalker

Date

CHUCK TO ROCK.	~~TOTAL~~ DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
23.25	8P-12			See	1 3/4"		
19.38	3.87	3.87	1	Column 2			
16.25	3.13	7.00	1			→	Not retaining
13.62	2.63	9.63	1			→	properly
10.37	3.25	12.88	1			1 20/32	
11.78	New hole						
9.50	2.28	15.16	1				
19.62	New hole						
19.00	.62	15.78	1			1 20/32	Bit too soft
	8P-14						
25.40							
22.68	2.72	2.72	1		1 3/4"		
20.06	2.62	5.34	1				
17.75	2.31	7.65	1				
15.70	2.05	9.70	1				
13.75	1.95	11.65	1				
12.43	1.32	12.97	1				
11.62	.81	13.78	1			1 19/32	
	8P-16						
Did not hold up as well as 8P-14							

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No 1 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 1½"
Length of Steel Regular 3rd
Kind of Steel EJAB 1⅛" hollow round
Air Pressure 80 #

Names
E. O. Stoliker
P. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
32.37		4P-3		Same as Column 2	1½		
27.75	4.62	4.62	1				
24.05	3.70	8.32	1				
21.05	3.05	11.37	1				
18.00	3.05	14.42	1				
15.75	2.75	17.17	1				
12.25	2.50	19.67	1				
10.00	2.25	21.92	1			1 11/32	
34.00	New hole						
30.25	3.75	25.67	1				
27.50	2.75	28.42	1				
25.12	2.38	30.80	1				
22.25	2.87	33.67	1				
20.00	2.25	35.92	1			1 9/32	Points considerably chipped
→	Drilled into another hole						
		4P-6					
34.87							Temper too soft
33.50	1.37		1				
33.00	.50		1				
32.50	.50		1				

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Waterleyner

Kind of Bit Regular Cross bit

Gauge 1 1/2"

Length of Steel 3rd

Kind of Steel FJAB 1⅛" hollow round

Air Pressure 80 lbs

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
33.00	4P-8			Same as	1 16/32		
27.50	5.50	5.50	1	Column 2			
21.75	5.75	11.25	1				
15.87	5.88	17.13	1				
34.12	New hole						
31.37	2.75	19.88	1				
27.75	3.62	23.50	1				
24.62	3.13	26.63	1				
21.75	2.87	29.50	1				
18.12	3.63	33.13	1				
15.00	3.12'	36.25	3/4'	4.16			
38.65	New hole						
33.75	4.90	41.15	1				
29.50	4.25	45.40	1				
→	Last gage					1 9/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular Cross-bit
Gauge 1 1/2"
Length of Steel Regular 3rd.
Kind of Steel FJAB 1/8" hollow round
Air Pressure 80 #

Names
R M Simrall
E O Stoliker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
31.25		4 P-12			1 15/32		
26.87	4.38	4.38	1				
23.50	3.37	7.75	1				
33.00	New hole						
27.75	5.25	13.00	1				
22.87	4.88	17.88	1				
18.37	4.50	22.38	1				
14.62	3.75	26.13	1				
10.25	4.37	30.50	1			1 21/64	
30.62	New hole						
25.62	5.00	35.50	1				
20.87	4.75	40.25	1				
16.50	4.37	44.62	1				
12.50	4.00	48.62	1			1 10/32	
30.00	New hole						
24.88	5.12	53.74	1				
19.62	5.25	58.99	1				
15.00	4.62	63.61	1				
13.62	1.37	64.98	1/2	2.75"		1 19/64	
	Cont over						

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine

Kind of Bit

Gauge

Length of Steel

Kind of Steel

Air Pressure

Names R. M. Simrall, E. O. Stoliker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
30.62	4 P-12 con't			Same as			
27.25	2.37	67.35	1	Column 2			
22.87	4.37	71.72	1				
19.30	3.57	75.29	1				Lost gage

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner

Kind of Bit Flat Cross-bit-high center

Gauge 1½"

Length of Steel Regular 3rd.

Kind of Steel EJAB 1⅛" hollow round

Air Pressure 80#

Names
E O Stoliker
R M Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
36.75		4 R-F-17		Same as	1½"		
29.37	7.38	7.38	1	Column 2			
24.00	5.37	12.75	1				
18.10	5.90	18.65	1				
13.05	5.05	23.70	1				
7.87	5.18	28.88	1			1 25/64	
31.25	New hole		1				Machine not working properly Water leaking into valve chest.
27.45	3.80	32.68	1				
24.50	2.95	35.63	1				
21.62	2.88	38.51	1				
18.45	3.17	41.68	1				
15.95	2.50	44.18	1				
14.08	1.87	46.05	1			1 11/32	
32.35	New hole		½				
27.50	4.85	50.90	1				
23.87	3.63	54.53	1				
19.62	4.25	58.78	1				
17.25	2.37	61.15	1			1 10/32	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Flat X-bit - high centre
Gauge 1½"
Length of Steel 3rd
Kind of Steel EJAB 1⅛" hollow round
Air Pressure 80 #

Names
R. M. Simrall
E. O. Stalker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
26.00	4 P-F-21			Same as 2nd Column	1 15/32		
22.38	3.72	3.72	1				
18.17	4.11	7.83	1				
14.17	4.00	11.83	1			1 13/32	
13.87	3.00	New hole					
10.87		14.83	1				
29.68	New hole						
24.50	5.18	20.01	1				
21.12	3.37	23.38	1				
17.70	3.42	26.80	1				
14.17	3.53	30.33	1				
10.50	3.67	34.00	1			1 12/32	
	4 P F-22						
31.30							
25.87	5.43	5.43			1½"		
22.94	2.93	8.36					
17.38	4.56	12.92	1½'	3.04			
14.87	2.51	15.43				1 13/32"	
	Con't over						

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine

Kind of Bit

Gauge

Length of Steel

Kind of Steel

Air Pressure

Names
E. O. Stoliker
R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
	4P-F-22 cont				$1\frac{13}{32}$"		
30.30	New hole			Same as 2nd Column			
26.62	3.68	19.11	1				
22.87	3.75	23.86	1				
19.62	3.25	27.11	1				
16.87	2.75	29.86	1				
14.06	2.81	32.67	1				
11.25	2.81	35.48	1				
8.32	2.93	38.41	1			$1\frac{11}{32}$	
30.12	New hole						
26.80	3.32	41.73	1				
24.30	2.50	44.23	1			$1\frac{11}{32}$	

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
Kind of Bit Regular 6 point
Gauge 1½"
Length of Steel Regular 3rd
Kind of Steel EJAB 1⅛" hollow round
Air Pressure 80 #

Names
R M Simrall
E O Stoliker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
23.37	6 P-3			Same as	1½"		
18.35	5.02	5.02	1	2nd Column			
14.00	4.35	9.37	1				
10.37	3.63	13.00	1				
7.00	3.37	16.37	1			1 13/16 2	
23.62	New hole						
20.00	3.62	19.99	1				
15.62	4.37	24.36	1				
10.50	5.12	29.48	1				
6.30	4.20	43.68	1			1 12/32	
21.37	New hole						
16.50	4.87	48.55	1				
13.62	2.88	51.43	1				
12.50	1.12	52.55	1				
12.00	.50	53.05	1			1 11/32	
28.00	6 P-7				1½"		
24.16	3.84	3.84	1				
21.12	3.04	6.88	1				Low pressure
17.00	4.12	11.00	1				
13.25	3.75	14.75	1			1 11/32	Not holding up wall

Cont over

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine .....

Kind of Bit .....

Gauge .....

Length of Steel .....

Kind of Steel .....

Air Pressure .....

Names
E. A. Stalker
R. M. Simrall

Date .....

CHUCK TO ROCK.	~~TOTAL~~ DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE START	GAUGE FINISH	REMARKS
29.00	6P-7 cont. New hole						
26.12	2.87	17.62	1	Same as Column 2			
23.20	2.92	20.54	1				
20.62	2.58	23.12	1				
19.37	1.25	24.37	1				
19.00	.37	24.74	1			1 11/32	Lost gauge
	6P-11						
32.67					1½"		
27.87	4.80	4.80	1				
24.62	3.25	8.05	1				
21.62	3.00	11.05	1				
18.75	2.87	13.92	1				
16.30	2.45	16.37	1				
13.75	2.55	18.92	1			1 12/32	
31.20	New hole						
29.30	1.90	20.82	1				
28.30	1.00	21.82	1				
27.87	.43	22.25	1			1 11/32	

CONCLUSIONS:

Contrary to expectations based on tests of piston drills it is observed upon examination of a majority of the curves on plates I to VI inclusive, that the maximum drilling speed was obtained at the beginning of each hole, the drilling speed dropping to a minimum at the end of the hole. A like result was obtained for each succeeding hole in which the same bit was used without resharpening.

A number of the curves show a slight increase in drilling speed near the middle of the holes. This was influenced, in all probability, by the position of the machine in the guides.

The most favorable results as to drilling speed and total distance drilled were obtained with the special Flat cross-bit.

In conclusion, all bits for the water-leyner machine may be said to give a relatively high drilling speed in hard rock and a relatively low total distance drilled without resharpening.